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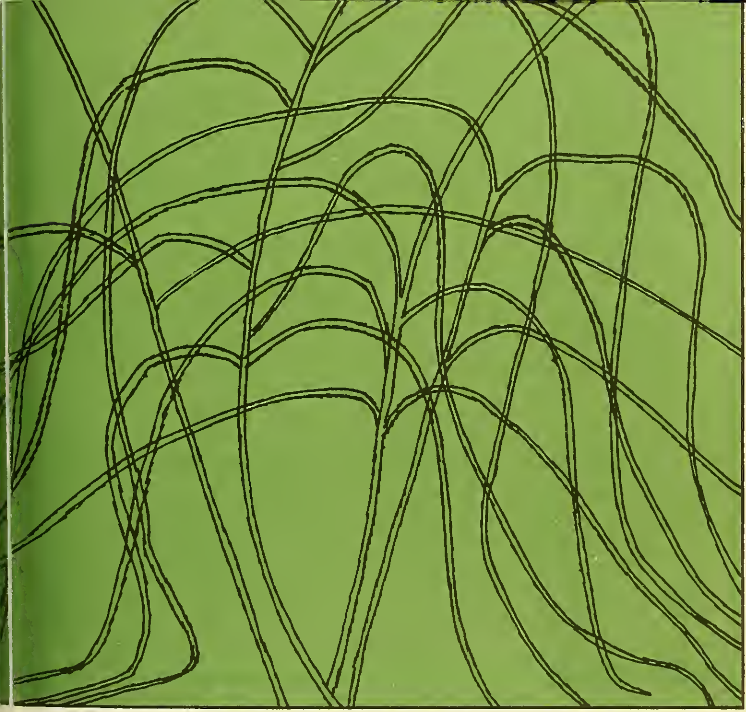

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H AERIAL HERBICIDE APPLICATION

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ontrol of Brush in Pastures Vith Aerial Herbicide Application

G. C. Anderson, C. Veatch, J. Newman, W. Gillespie

ntroduction

ONTROL OF brush is not difficult on lands which are accessible. The safe operation of farm machinery and easy fencing for animal control can be hieved on such lands. This is not the case for remote, inaccessible, steep, and ugh areas. In West Virginia the 451,800 acres of permanent pasture Class VI nd includes about 96,800 acres so rough and rocky that conventional farm achinery cannot be used safely. Also, 684,000 acres of Class VII permanent sture are not considered to be safely accessible. Therefore, a total of 780,800 res of grazing land, 42 per cent of the total,[1] must be managed without farm achinery.

Steep hill grazing lands represent a valuable national agricultural resource ich will become more important as competition for better land increases. me of these areas are capable of quality forage production when managed rrectly as permanent pasture. The greatest value results when they are ectively managed in combination with better lands that are used to provide nter feeds. Thus, reversion of hill grazing lands to brush has a significant effect on how West Virginia's limited Class I-IV croplands can be used. Clearly, cedures to prevent and counteract this reversion are needed, not only to ntribute to the maintenance of a viable agriculture, but also to satisfy the reasingly demanding needs of the future—such as those for animal protein, reation, and open space.

At least two prime factors are essential in managing hill pastures:

1. A level of soil fertility must be maintained which will insure a dense er of desirable grasses and legumes. It will then be difficult for undesirable ody species to become established.

2. Proper grazing is necessary. Uncontrolled, continuous, season-long zing of large pastures allows undesirable species to escape grazing unless the ire area is detrimentally overgrazed. Continued overgrazing will lead to soil letion and deterioration of sod cover. Controlled close grazing, at specific ervals, with the proper combination of cattle and sheep will effectively

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[1] Conservation Needs Inventory 1967. West Virginia Soil Conservation Service. United S tes Department of Agriculture, Morgantown, West Virginia. Does not include woods or h land-pasture in crop rotation.

discourage or prevent establishment of brush or woody plants. Unless suc essentials are included in an effective pasture management system, hill pasture readily revert to a woody type vegetation, necessitating the use of mechanic and chemical—or combinations of the two—methods of control.

The total natural reversion does not happen rapidly. There is a lon unproductive time lag while intermediate reversion stages occur. During th period no economic return from forage species or wood production can b realized.

Material, Methods and Location

This study was undertaken to evaluate the effectiveness of herbicide applied by helicopter for brush control on hill pastures. Herbicide applicatio were made in late June and early July, 1966, and the results were evaluate annually through 1969. Areas for treatment were selected in Hardy, Gran Monongalia, Pendleton, Randolph, and Taylor counties. Such items as existin cover species, grazing management, elevation, soil type and fertility, an exposure were noted before herbicide application.

On each treated area, three to four representative plots of 1/100 acre we staked out as monitor areas to be examined closely in determining th effectiveness of treatment. Detailed observations of percentage of kill, speci susceptibility, sprouting, recovery, invasion of herbaceous species, anim penetration into treated areas, and rate of woody decomposition were made c these plots. These observations were supplemented by an estimate of effect c the entire area.

With a few exceptions, which are noted, one type of herbicide treatme was used consisting of five gallons of water, one gallon of number two diesel o and one gallon of herbicide containing two pounds of 2,4,5-T and two pounds 2,4-D per acre.[2]

Results and Discussion

Prior to the application period, abnormally low temperatures and subnorm rainfall resulted in very poor growing conditions. The period of below norm temperatures was followed by a period of relatively high temperatures at t time of spraying.

The moisture deficiency continued after spraying so that in many are growing season precipitation was only one-half to two-thirds normal.[3] All th factors combined to reduce the likelihood of effective results. This should

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[2] 2,4,5 Trichlorophenoxyacetic acid, butoxy ethanol ester. 2, 4 Dichlorophenoxyac acid, butoxy ethanol ester. Obtained from Amchem Products, Inc., Ambler, Pennsylva

[3] Climatological Data West Virginia Annual Summary, 1966, Vol. 74, No. 13, U Department of Commerce, Environmental Sciences Division.

IGURE 1. The helicopter and airplane can be agricultural implements as important in the anagement of hill country as the tractor is on gentle country. The Bell Model G-24 licopter shown here was used.

onsidered in evaluating the results obtained, for without question, effectiveness ould have been much greater if climatic factors had been more favorable.

Careful consideration should be given to actually postponing aerial foliar oplication of herbicides when growing conditions are limiting rapid, vigorous owth of the species the herbicide is to control.

Increasing the rate of application from 4 lbs. of chemical to 8 to 12 lbs. did ot necessarily result in increased control. Negative results were actually otained on blackberry, one of the easy to control species. With high rates, top owth turned brown in 2-3 days. An early apparent 100 per cent kill soon made pid recovery from the rooting system which appeared very healthy upon amination. Top kill was so rapid that required translocation of the herbicide the roots did not occur.

Defoliation on treated areas was strking, and early estimates of treatment fectiveness were optimistic. However, an evaluation made a year after plication clearly showed that control was not as good as expected. Some ants had recovered completely, whereas others had been injured only to the tent that the ends of branches had been killed. In still others, sprouting curred from trunk and root tissue which seemed to escape injury. Therefore, a llowup treatment within two years of the initial application is essential, if isfactory brush control is to be secured.

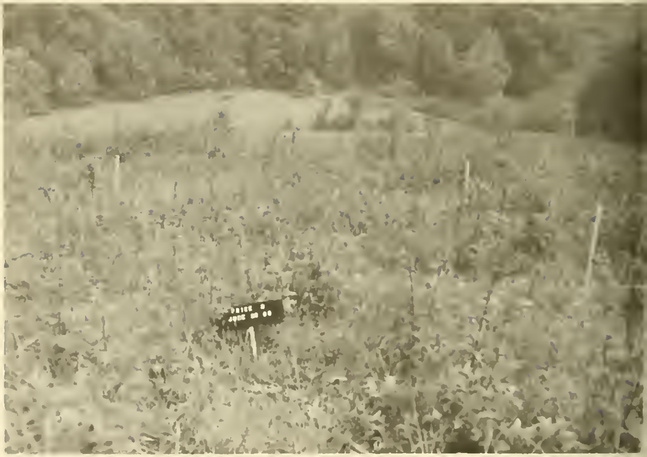

FIGURE 2. The time to spray brush is when it is in the early stages of growth. Most specie are easier to control while they are young and small.

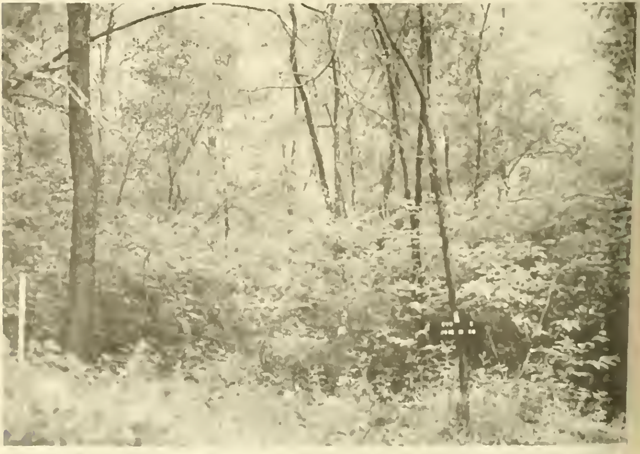

FIGURE 3. When growth has advanced to this stage control is difficult and may be m expensive than returns can justify.

Some species were more resistant to treatment than others. Ten were not affected to any appreciable degree. A rating of susceptibility, based on the monitor plots, is given in Table 1. In species of hawthorn, oak, and hickory effectiveness of treatment was much greater in the young original plants. Sprouts, or regrowth following cuttings, were very resistant to herbicides. Such plants have an unusually large amount of root tissue in relation to leaf area and adsorption of herbicide from the limited leaf area was not great enough to kill all of the root tissue, or translocation was reduced by the scar tissue as a result of the cutting.

Pasture brush often represents a mixture of woody plant species. When species susceptible to the herbicide, such as blackberry and hawthorn, are ntermixed with resistant species, such as maple, herbicide treatment reduces competition for the resistant species and encourages their rapid growth. When such a mixture exists, the method of treatment must be effective against the hard to control species. Useful information in respect to this problem may be found in a West Virginia Agricultural Experiment Station publication.[4]

The photographs which follow illustrate before and after conditions on espresentative areas.

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[4] The Use of Herbicides in Forest Management Practices in West Virginia. K. L. Carvell d H. P. Berthy, West Virginia Agricultural Experiment Station, Circular 15, 1965, West irginia University, Morgantown, W. Va.

TABLE 1

Summary of Observations on Susceptibility of Different Species of Woody Plants to 2,4,5-T and 2,4-D

Key:

S = Susceptible, 8–100% control by one application. Spot treatment may be desirable.

M = Medium control by one application, 50-80%. Second treatment should be made in two to three years or followup spot treatment may be needed for satisfactory control.

R = Resistant, 25-50% control by one application. Feasibility questionable. More effective herbicide and method of application should be sought.

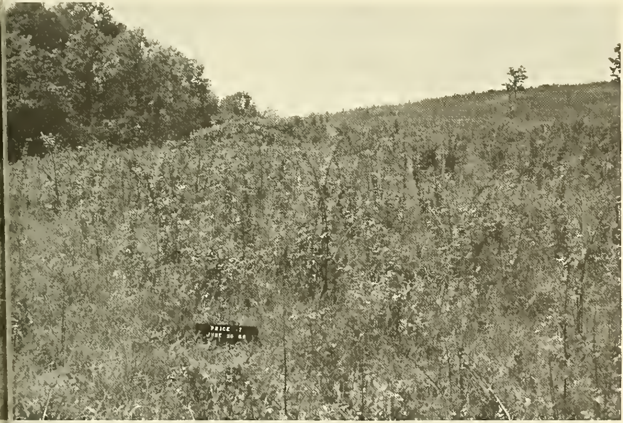
HR = Highly resistant, 0-25% control by one application. Feasibility highly questionable. Aerial spraying for control not effective. Other methods and/or herbicides should be sought.

V = Variable, results ranged from excellent control to no effect.

Identity	Sprouting**	Susceptibility
Blackberry	x	S
Birch		S*
Black Haw		R
Blueberry (Huckleberry)	x	R
Black cherry	x	S
Dogwood		V
Crab Apple		M (V)
Elderberry	x	S
Elm		HR
Greenbriar		HR
Thornapple	x	HR
Hickory	x	M
Hickory sprouts (regrowth)	x	R
Juniper		HR
Laurel		HR
Locust, black	x	S
Maple		HR
Oak		R (V)
Poplar		M to S
Pine		R
Osage orange		S
Rose, wild		R
Sumac		S
Sassafras		S
Walnut		S

*Too few trees involved to make reliable assessment, but limited observations suggest indicated level of susceptibility.

**Indicated species developed new regrowth or sprouts.



FI RE 4. June 20, 1966. Before treatment this hill pasture was in early stages of ev sion. Blackberry, sumac and running briars with a few small thornapple trees can be ee Poverty grass and bluegrass are the dominant grasses, with some broomsedge. Tre ment: 7 gals. per acre containing 5 gals of water, 1 gal. diesel fuel, and 1 gal. of ,4 T and 2,4-D (which contained 2 lbs. of each compound).

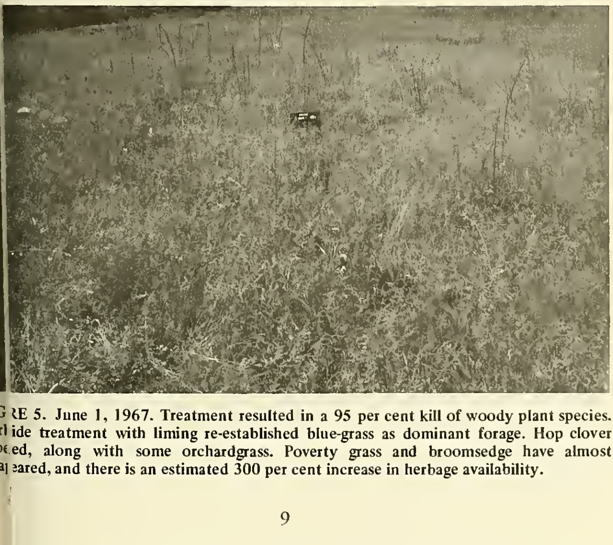


FIG E 5. June 1, 1967. Treatment resulted in a 95 per cent kill of woody plant species. Her ide treatment with liming re-established blue-grass as dominant forage. Hop clover app ed, along with some orchardgrass. Poverty grass and broomsedge have almost disa eared, and there is an estimated 300 per cent increase in herbage availability.

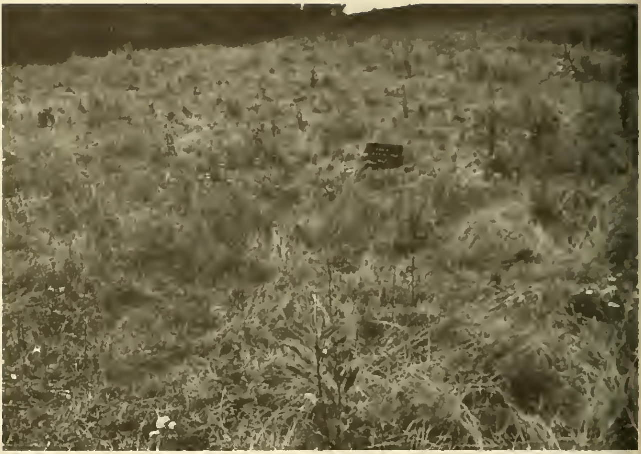


FIGURE 6. July 15, 1968. The use of recommended lime and fertilizer increased forag
production and animal movement into brushy areas opened up by spraying. For compariso
refer to Figures 4, 5.

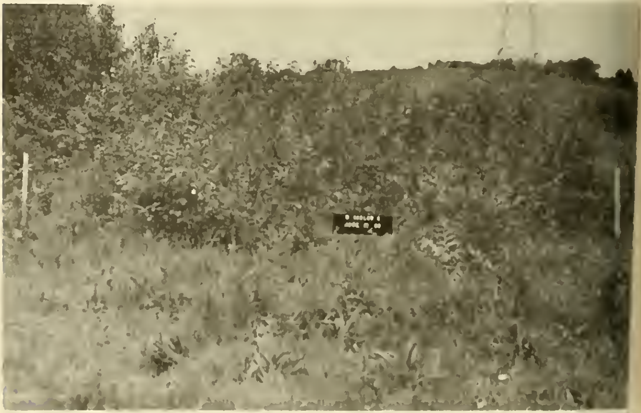


FIGURE 7. June 21, 1966. Before treatment. Another stage in reversion is illustrated he
Clumps of thornapple trees with some blackberry on the outside. Standard treatment w
applied.

IGURE 8. June 1, 1967. Seventy-five per cent of thornapple has been killed and all were everely defoliated. Some of the trees which appear to be dead in this photograph have eaves emerging along the trunk and sprouts coming out at the base. These bushes will urvive and will need to be treated within two years.

IGURE 9. July 15, 1968. Recovery of brush partially defoliated is evident. Follow up ontrol is needed to continue effective control. Follow up may be by basal chemical reatment, mechanical cutting or other techniques depending on situation. For comparison efer to Figures 7 and 8.

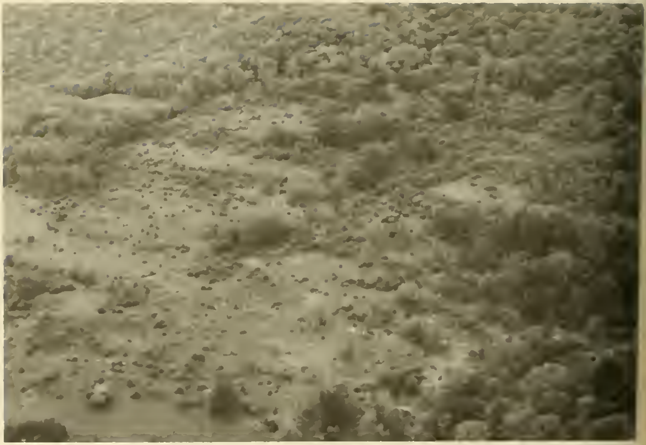


FIGURE 10. All stages of reversion are present on this mountain pasture which is on limestone based soil. Reversion or appearance of woody plants in this potentially productiv pasture did not begin until sheep were removed and division fences were neglected.

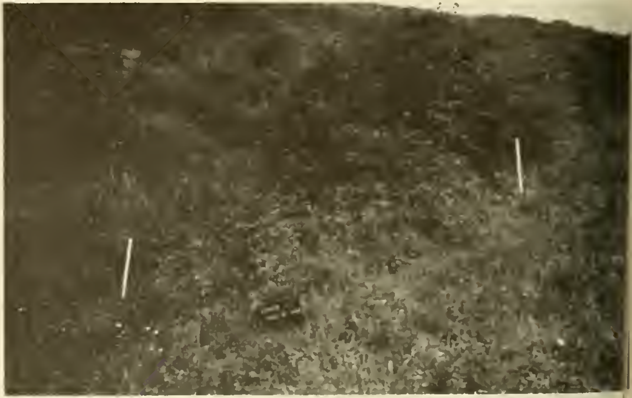


FIGURE 11. June 29, 1966. Linger Farm 1. This is a part of the area shown in the prev s aerial photograph (Fig. 10) and is typical of much of the brush problem on this moun pasture. It represents an advanced stage of reversion. Primary brush species are thornap and blackberry.

IGURE 12. August 17, 1967. Linger Farm 1. Two pounds of 2,4,5-T and 2,4-D per acre in gals. of liquid resulted in a 90-95 per cent kill of blackberry species and 60 per cent of ornapple species.

URE 13. July 11, 1968. Linger Farm 1. Recovery of thornapple from small areas of wth on each plant surviving initial control is quite rapid.

Conclusions

Aerial applications of 2,4,5-T and 2,4-D accomplished reasonable initial control of many species of woody plants in pastures. Blackberry and thornappl (crategus species) represented the most common problem and these species wer most effectively controlled by the herbicides used. On the other hand, species o maple, oak, and hickory were damaged by the treatment, but were no controlled.

Application of 2 lbs, of 2,4-D plus 2 lbs. of 2,4,5-T acid per acre gav control as consistantly as higher rates of 8 to 12 lbs. per acre. High rates, over lbs. total acid per acre, may give negative results on susceptible species in tha top kill occurs so rapidly that translocation of the herbicide to the root fo complete plant kill cannot take place.

Thoroughness of herbicide application, leaf absorption, and translocation i the plant are major factors influencing the effectiveness of the herbicide Climatic factors such as temperature and moisture were less than optimum. As result the control of predominant susceptible species, thornapple and blac berry, varied from 20 to 100 per cent, with an average estimated control of 6 per cent.

Retreatment of an area or spot treatment of surviving plants should b undertaken within two growing seasons after the initial application if benefits the initial treatment are to be expanded to a satisfactory level of control. Aft two seasons, recovery is very rapid and the value of initial treatment is lost.

Without question herbicides correctly chosen and properly applied can effective tools in grazing land management. However, it would be a most serio mistake to rely on foliar application of chemical agents alone as a means pasture brush control. Other application techniques, mechanical control, fenci to control animal grazing, and a level of fertility capable of supporting a hi density of desirable herbage plants are profitable means of discouragi establishment of woody species. Wise combinations of methods will be mo effective and may be the most economical.

-CAUTION-

Herbicide application should be conscientiously planned, applied, and c ntrolled. When herbicides are handled or applied improperly, or if unused p rtions are not disposed of safely, they may be injurious to humans, domestic a mals, desirable plants, fish or other wildlife and may contaminate water s pplies. Spray drift can contaminate nearby crops, gardens, or other vegetation. **F llow label directions and precautions precisely.**

2,4,5-T **cannot**, at the time of this printing, be used:

–in any form to spray in or on lakes, ponds, and ditch banks.

–in liquid form or granular form around the home, recreational areas, and similar sites.

–in any form on food crops intended for human consumption such as apples, corn, rice, etc.

It can be used for control of weeds and brush on pasture, forests, ri ts-of-way, and other non-agricultural land. However, milk cows must not g e treated areas for **at least seven days** after application.